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Comments on the Pacific Lumber Company Sustained Yield Plan/Habitat Conservation Plan and the Draft Environmental Impact Statement/Environmental Impact Report

Re: Permit Nos. PRT 828950 and 1157
SYP 96-002

Comments on the Pacific Lumber Company Sustained Yield Plan/Habitat Conservation Plan and the Draft Environmental Impact Statement/Environmental Impact Report

The Habitat Conservation Plan (HCP) is projected over a 120 year period in some places, 105 and 50 years in others, but for purposes of the following comments we will use the more realistic 35-year planning period. As we interpret the conditions of the HCP, the following will occur within the next 11 to 35 years on PALCO lands:

- Forest openings will increase by more than 200% by the 2nd decade.

- Late seral forests will be reduced by 2/3 by the 3rd decade.
  (A contradiction occurs in the HCP regarding late seral habitat changes. The statement occurs on p 34, Vol. I: "However, the amount of late seral habitat in the Plan Area will increase over the period [120 years]." But this statement is not born out by the data given in Table 10, p. 31, Vol. I. Late seral forest is reduced from 53,236 acres at present to a low of 17,710 acres by the third decade and reaches its highest point again of 41,886 after 120 years.)

- Old growth will be permanently reduced by approximately two-thirds.

- Young forests will nearly double by the third decade. We have graphed data from maps 5, 21, 22, 23, 24 (Vol.V), to show a summary of these forest type trends in Fig. 1.

- Hardwood will be almost eliminated by the third decade.

- Sixty eight percent of the old growth redwood will be harvested in the first decade [Table titled Harvested Volume Per Decade by Log Type (Vol. III, part C)].
  (The failure to number tables and pages consecutively throughout parts of the HCP make reference unnecessarily difficult.)

- Cattle grazing will increase from a current 600 head to 1000 head.

- Miles of road will increase by approximately 350, an approximate 23% increase over current mileage of 1,533 miles of existing road.
  (Note: existing road miles given in HCP apparently do not include miles of public roads through PALCO lands (Map 8, Vol. V) or other roads outside PALCO lands but within the watershed assessment areas).

- Approximately 550 to 1750 additional stream enhancement projects will be completed (approximately 50 projects are completed each year).

- Gravel mining will continue at current levels of 160,000 cubic yards of gravel/year from Eel River gravel bars.

- Fish rearing facilities will continue to capture and raise unlisted species and release young (and in these operations listed fish species will continue to be incidentally taken).

- A wide variety of herbicides will be used and applied by ground-based methods.

- No no-harvest areas are guaranteed in the riparian systems of any stream class.

- Minimal prescribed stream buffers will be in place, in the short term, on approximately 1,016 miles of stream (Class I and II watercourses). Buffer widths and treatments are subject to negotiation in the long term.

- No buffers will be in place on approximately 3,200 miles of as yet unmapped stream (Class III).

- In most Class I and Class II stream buffer zones, remaining old growth will be greatly reduced or nearly eliminated within 50 years [Table titled Projected Forest Seral Types in Class I and II Stream Buffer Zones (Vol. III, Part C)].

- No protection of the riparian forest zone is planned. Riparian forests will become thinned edge habitats between clear cuts and streams.

In summary, it is difficult to see how these future conditions comprise a Habitat Conservation Plan for PALCO lands.

Current conditions of streams on PALCO lands

Streams are integrators of land use conditions. As such, they provide a measure of how well or poorly land is being managed. A measure of present conditions for streams in the five watershed assessment areas (WAA) is given in the HCP [Vol. I, Table 8 and Vol II, Sec H, Table 2 (same table)]. The data presented in the table should have included the number of samples and the variation in order for readers to fully evaluate the mean values reported. The rank order of the five watersheds in the table has no meaning with regard to the stated criteria for good and poor conditions. Further, this table has different values for some of the "mutually accepted" criteria as discussed

in Vol. IV, Part D, Sec 1, Table 7, p. 98. Because the criteria all have different values for good and poor conditions, interpretation of these tables is difficult.

We have, therefore, rescored the values to a common scale (for only the 10 variables with condition criteria) in order to facilitate interpretation (Fig. 2). The figure shows clearly that the general condition of the streams surveyed in the five watersheds is not good. In 34 of the 50 individual scores, they lie below 50% of the criterion of fully functional conditions (=good) and 11 of those are even below poor. NADCE-1

These conditions represent the state of watersheds under California's current Forest Practices Rules. It may also be argued that rules have not been complied with or that streams have not recovered from past impacts.

In Table 1 we have shown figures for three components of projected riparian functionality (surface sediment, large woody debris and canopy cover) given in the HCP under existing Forest Practices Rules, under the PALCO approach, and under the National Marine Fisheries Service (NMFS) approach. In the last two columns we have both multiplied and averaged the three components to show an overall value of the riparian conditions. We do not know which of these two approaches (multiplying or averaging) is more accurate, but because many factors are interactive we think the multiplicative approach may be more realistic For example, PALCO has applied the same logic for multiplying DI coefficients for yarding and harvesting. In either case, it is clear that current practices fall far short of what is needed to provide beneficial conditions in riparian areas. The NMFS approach is better than the other two but even so, does not attain full functionality. Further, these projections are based on the assumption that all mitigations will be successful. Given the history of landslides in the area and of PALCO compliance with current rules, and the near-absence of protection for Class III streams under any of these three approaches, this assumption of success is not realistic. NADCE-2

Disturbance Index and Cumulative Impact Assessment

PALCO has developed its own Disturbance Index (DI) patterned after the Equivalent Roaded Area (ERA) methodology developed by the USDA Forest Service to assess cumulative impacts (Vol. I, p. 19). This DI is based only on timber management activities and, therefore, is not a satisfactory method for estimating cumulative impacts in a watershed. One of the most noticeable shortcomings of the DI is that it assumes a linear 10-year period for full recovery for the various disturbances . "For each year elapsed since the treatment occurred, the disturbance level is reduced by 10%" (Vol. I, p.19). This assumption would mean that roads have no impact after 10 years, that landslides disappear after 10 years, etc. Elsewhere in the report are multiple references to continuing disturbance from activities on PALCO lands (e.g., NADCE-3

NADCE-3 con.

low canopy levels in the Yager WAA that date to "historic logging of streamside trees" (Vol. II, Part H, p. 21) and some date as far back as the period of railroad logging which in the opinion of PALCO are so large as to make evaluating current conditions difficult. Although the HCP acknowledges the different rates of recovery from different kinds of disturbance, it fails to include an assessment of such long-term, slow-to-recover disturbances in its DI. Further, the HCP states that even in the case of improvements to old roads, the time frame for conducting the restoration of such old roads is 30 years. The HCP brushes aside such concerns by concluding that, given uncertainty in knowing real recovery, all disturbances are given a 10 year recovery period and states that such a procedure is valid because it allows connection to their SYP planning and "comparative analysis of cumulative impacts" (Vol. II, Part E, p. 5). Such a statement about comparative analysis is wrong in principle because some activities do take longer to recover (as already noted in their analysis) than others. Therefore, without explicit incorporation of different recovery times, comparison of alternatives is meaningless because one of the most important factors is ignored in evaluating alternatives for cumulative impact assessment. USDA Forest Service ERA methodology and newer revisions of the ERA procedure in the Sierra Nevada Ecosystem Project (SNEP) report show that many disturbances have different rates and periods of recovery; some carrying a coefficient for many decades (SNEP, 1997, Addendum, p. 88–89).

In addition, there is no apparent inclusion of past disturbance in the calculation of the DI. The report does not list any coefficients for the kinds of past disturbances acknowledged as continuing to cause significant problems (e.g., landslides, Humboldt crossings, skid trails, railroad grades, Vol. IV, Part D, Sec. 1, p. 109). Thus, this rating system is making the assumption that PALCO lands currently have no impacts. This assumption is unacceptable for both cumulative impact analysis and for trend monitoring (discussed in a later section).

The DI system has omitted roads themselves, saying that the logging system incorporates this factor ("instead of treating roads as a separate factor, the DI correlates roads with the yarding methods." Vol II. Part. E, p. 4). The report does not include any description of how different kinds of roads will be scored even though it acknowledges that old roads are a major source of problems and that a program of road improvement will require 30 years at the rate they plan to work. These older roads, with much worse location, layout, and mitigation should at a minimum have a coefficient larger than 1.0 (1.5 or 2.0 as, for example, recommended by USDA Forest Service to the SNEP) and remain with this score until restored as per the work schedule.

The report acknowledges that relative impacts from disturbances are partially a function of distance, especially from watercourses (Vol. II, Part E, p. 2). Nevertheless, the DI system incorporates no methods for weighting

NAOCE-3 con.

disturbances as a function of proximity to critical areas. (SNEP, Chapter 2, Addendum and McGurk and Fong 1995 illustrate a process for weighting disturbance in proximity to streams.) The report has made only a general statement and summary of "risk" due to roads being in some, unspecified, proximity to watercourses (Vol. II, Part H, p. 17) in spite of the fact that GIS analysis would allow easy calculation of roads within existing or proposed riparian management zones (as was done in the SNEP report).

The DI scores "salvage" with a low (0.3) coefficient for a silvicultural method and scores it again under yarding method when the activity itself is undefined by the logging or yarding method. Salvage may be a reason for logging, but it is not a method. At a minimum, the score should be based on the harvest and yarding techniques used as in any other timber harvest activity. The DI scores "rehabilitation" as having a 0.7 coefficient but the HCP does not explain what is included in this term or how this component would be associated with the other half (yarding) in rehabilitation activities not normally thought of as logging.

The DI has not incorporated other disturbances in the procedure. Livestock grazing, for example, is evaluated as a disturbance factor in the report but is excluded from the DI. The SNEP report incorporated a coefficient for grazing in its analysis of ERA (SNEP, Addendum, p. 88–89). It should be said that the USDA Forest Service system is also based primarily on silviculture, and ERA methodology is evolving slowly in some National Forests to a more complete system of assessing impacts. Values for many other impacts are missing from this DI rating system e.g., gravel mining, water diversions, instream habitat improvements, herbicides, rock quarrying, wildfire, landslides.

Water diversions represent a cumulative impact because they change the sediment transport capacity of streams. The DI assumes that whatever sediment reaches a streamcourse will be transported under natural flow conditions. The report has presented no information on water rights diversions in the project area. Are there any? Because sediment transport has been measured as a function at least proportional to the square of discharge, any reduction in natural flow will have a disproportionate effect on sediment transport capacity. This factor and relationship must be incorporated in any accounting method of cumulative impacts and interpretation of DI calculations for a watershed.

Additional cumulative impacts are discussed under a later section titled Fish Rearing Facilities and Stream Enhancement Projects.

It sounds as if PALCO has no intention of developing a meaningful DI rating for cumulative impact analysis. The following statement occurs on p. 109, Vol. IV: "Given these and other difficulties, PALCO does not believe

cumulative impact assessment methodology is available that can identify the incremental impact of a given amount of management activity (e.g., acres harvested or road miles constructed). Accordingly, the company proposes to follow the widely used practice of trends monitoring to assess whether cumulative effects are present." If PALCO can not, or will not, carry out cumulative impact analysis, how can it do watershed assessment of which cumulative impact analysis is a part?

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Aquatic Strategy and Riparian Management Zones

The aquatic strategy has some good elements and may well be stronger than the current weak Forest Practice Rules requirements, but in our opinion both the interim and default strategies outlined in the HCP and the EIS/EIR fall far short of necessary stream and riparian protections and will fail to protect stream habitat.

NADCE-4

Accepted River Continuum Concept theory recognizes that streams are a continuous gradient of physical variables from the headwaters to the mouth and that what happens upstream is inextricably linked with conditions and assemblage of biota downstream. Further, small streams are more affected by contiguous terrestrial conditions than are large streams. The strategy in the HCP is to give more lateral protection to large streams (Class I) than to smaller (Class II) and no lateral protection to the smallest streams which comprise by far the greater stream mileage in the PALCO watersheds. The omission of buffers of any kind on approximately 3,200 miles of stream will not only affect the physical condition and biota in and near these streams, but will also likely fail to provide desired conditions in the fish bearing streams. Emphasis has been placed on establishing rules for minimal buffers on Class I streams and even smaller buffers on Class II streams, thereby missing the point that impacts to any given spot in a stream come from the watershed above it.

The Class III streams have not been mapped yet, but the HCP claims that there is no life present in Class III streams (Vol. I, p. 18). We doubt this claim. Temporary streams in the western coastal states contain a diversity of aquatic invertebrate life specifically adapted to annual dry periods. Furthermore, some such streams are highly productive and provide food for a diverse group of semi-aquatic and terrestrial organisms. There is little evidence in the HCP of an understanding or consideration given to maintaining food webs. For example, the statement is made that "Class I streams contain fish so sediment in these streams is arguably more important" [than sediment in Class II streams] (Vol IV, Part D, Sec 5, unnumbered third page). This statement reveals a lack of knowledge about invertebrate food production, how sediment affects invertebrates in all stream classes, and the importance of aquatic invertebrate food production to terrestrial organisms of many species (Erman, SNEP).

NADCE-4 CON.

An equally uninformed discussion of large woody debris (LWD) and its function in small streams occurs on the previous page from the above quote (Vol IV, Part D, Sec 5, unnumbered second page) in which the author rationalizes that large woody debris is not as important in Class II as in Class I streams as follows: "LWD in Class II streams can help to retain and "meter out" sediment and leaf litter, thus LWD in these streams has a lessor [sic], but still important role." In fact, LWD retains organic debris and leaves that are the food base for a diverse invertebrate community. The function of LWD is probably more important, not less important, in small streams than in large streams. It stays in place. It stabilizes the headwaters and serves as small natural "check dams."

No buffer protections are given to a riparian habitat as distinct from either aquatic or upland terrestrial habitat. Riparian habitat is viewed here as edge habitat that provides shade to Class I and Class II streams, but is apparently not recognized as requiring protection from the adjacent impacts of clear cutting that would be expected to change the climate in the riparian habitat making it uninhabitable to the diversity of plants, birds, amphibians, mammals, invertebrates that reside there during at least part of their life cycles. In other words, there is no consideration given for a buffer to buffer the buffer. Recent studies document the changes in microclimate inside core forest or riparian areas from upslope openings (Chen et al. 1995; Brosofske et al. 1997) and the change in rates of tree fall in the riparian area when the upslope is cleared (Reid and Hilton 1998).

Ironically, the riparian management zones will have the highest rate of disturbance of all lands because they can be entered for selective logging of up to 40% of the conifer basal area every 20 years, as opposed to every 60 years in upland sites. A further irony is that under the 40% rule, the less dense a riparian area is to begin with, the more it could be thinned in proportion to a an area with higher basal area, thus some riparian areas may never recover over current degraded conditions. This rule creates an incentive for PALCO to never allow riparian areas to exceed a basal area of 500 square feet/acre in the Limited Entry Band on Class I streams. The same logic applies to the other bands and classes. The scale and frequency of activity in the limited entry band and outer band of the riparian buffer mean that these zones will provide little benefit to improving riparian conditions. The outer band will be adjacent to tractor logged clear cuts. Therefore, as a practical matter, the only effective stream buffer portion will be the innermost band of 30 feet for Class I streams and 10 feet for Class II offering little protection except for stream shade.

PALCO lists 44 species of terrestrial vertebrates as belonging to a "Riparian Forest and Shrub" guild (Vol. II, Part L). And yet their primary effort of collecting species information to date (Kennedy and Hiss,

NADCE-4 CON.

Multispecies Monitoring Study, Vol. II, Part K) does not stratify by this type. We assume that condition of the riparian forests and trends of riparian dependent species are being poorly considered in this HCP.

Recommendations for an all-community, headwaters to mouth, variable buffer continuum system were made in the SNEP report (Erman et al. 1996, Kondolf et al. 1996) but have been ignored here. A cursory comparison has been made in the HCP with the Forest Ecosystem Management Assessment Team (FEMAT) recommendations. In the SNEP report we have presented a model for a fixed, non-harvest buffer based on the biotic community and energy inputs to the stream and beyond that buffer, a variable buffer of selective harvest based on slope and soil erodibility. It is applied to all streams regardless of size or presence of fish.

FEMAT recommendations and the proposed buffers in AB 1986, incidentally, also rely on a fish-based, preferential large stream-buffered system as opposed to an all-community, headwaters to mouth, variable buffer continuum system. It is our opinion that they also would fail in the long term because they do not provide for adequate small stream, upper watershed protection, nor would they provide buffering for the riparian zones between streams and clearcuts. These are failings in all the Alternatives presented in the EIS/EIR. The no-action alternative offers the greatest stream buffer protection according to Table S-1, EIS/EIR, but would obviously be an "action" because streams do not have such buffer widths under current laws.

A misleading use of words appears repeatedly in the EIS/EIR where the term "no harvest" is used in referring to Riparian Management Zones (RMZs) (for example, Table S-1). The management in these so-called "no-harvest RMZs" is shown diagrammatically in Figs. 2.5-3a and 2.5-3b. As these last two figures refer only to alternatives 2, 2a, and 4, we have no idea what "no-harvest" means in alternatives 1 and 3.

We could find no data in the HCP that permitted estimation of current stand conditions in the RMZs for streams in the project area. Therefore, we cannot assess whether or not basal area requirements in the RMZs are reasonable. But the following statement is made: "Many streamside areas on PL's lands currently do not have sufficient basal area or enough large trees to permit harvest under the harvest restrictions included in the interim aquatic strategy" (Vol IV, Sec. 2.2.3, p. 105). We assume that past logging has greatly reduced trees in the riparian areas.

Current conditions in the Watercourse and Lake Protection Zones (WLPZs, riparian buffers per Forest Practice Rules) show that as of 1998 very little old growth remains (on an area basis, 0.3–12.0% of area in WLPZ for Class I and II combined for the 5 main WAAs) [Unnumbered table, "Projected Forest Seral Types in Class I and II Stream Buffer Zones (acres)" (Vol. III, Part

NADCE-4 CON.

C)]. In the first decade, this amount is projected to decrease even more to 0.06–11.2% and by decade 5, to 0.06–4.8% of the WLPZ. On a strictly areal basis, there were 1,175 acres of old growth out of 27,455 acres in the Class I and II WLPZ in 1998 and there will be 571 acres by the fifth decade for the 5 main WAAs.

If we assume that harvest will not occur in the Restricted Harvest Bands of Class I (0–30 feet) or Class II (0-10 feet), the harvest of remaining old growth in the RMZs will be concentrated in a narrow band of 140 feet or 90 feet directly beyond the Restricted Harvest Band.

The statement in both the HCP/SYP and the EIS/EIR that harvests in Restricted Harvest Bands will be done to "enhance" riparian conditions suggests that all riparian bands will be harvested, however.

The aquatic strategy seems to be a political, economic strategy rather than a plan based on known science. Further, the interim strategy is only in place until PALCO conducts watershed analysis and negotiates new standards with the agencies. The interim and default strategies seem too complicated to be followed or monitored for compliance. The purpose of an interim strategy seems to be only to allow the agencies to issue Incidental Take Permits (ITPs). The future negotiations between PALCO and the agencies represent an "approve now, analyze later" approach that should be unacceptable for certifying this HCP/SYP and EIS/EIR and for issuing ITPs. Why wait for three years after issuing ITPs, for watershed analysis? Why not require watershed analysis before issuing ITPs?

The requirements of AB 1986, should they go into effect, are also only temporary until watershed analysis is completed. Future requirements are even more uncertain because default strategies apparently are still being negotiated. "PL and the agencies have not yet fully resolved these issues to finalize this default strategy" (Vol. IV, Sec. 1.2., p. 26). A draft EIS/EIR begins to seem quite premature, especially considering that the preferred alternative in the EIS/EIR incorporates the HCP. Little has been decided concerning an aquatic/riparian strategy in the HCP.

We have small hope for meaningful stream protection under these prescriptions. We were surprised to read the optimistic description of the plan in the agency EIS/EIR (2.6.5.2, p. 2-66). We assume, therefore, that flawed as they are, PALCO's proposed aquatic management strategy, road management strategy, and hillslope strategy represent an improvement over present California Forest Practices Rules. But, given the record of this company of repeated violations of those rules, we find the confidence of the agencies, evident in the EIS/EIR, unwarranted.

Incremental benefit analysis

In making an assessment of proposed new protection of riparian conditions, PALCO has used literature to assemble functional relationships of buffers and various factors (e.g., large woody debris, canopy cover, surface sediment, particulate organic matter). From these relationships they have calculated the percentage of fully functional conditions that the various options or protections provide for these factors.

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First, the report cites Erman et al. 1977 (as used by FEMAT) as a reference supporting evidence of particulate organic matter inputs to macroinvertebrate communities. PALCO used some of the data from this study to calculate the relative amount of effectiveness (macroinvertebrate diversity index) provided by different buffer widths. To make the plot used in Volume IV, part D, Sec. 1, Figure 2, they used only a portion of the original data on buffer widths. A plot of all data (14 streams with buffers from 5-60 meters), included here (Fig. 3), shows that invertebrate diversity (= buffer effectiveness) for all 14 streams fits the same line on a log-log plot (hence a curvilinear relationship on an arithmetic plot). Buffer width accounts for 50% of the variation in diversity, and diversity continues to increase out to the widest buffer of 60 meters (197 feet) ($\log_{10}$ invertebrate diversity index = 0.13 * $\log_{10}$ buffer width + 0.215). This relationship should be used, rather than the one created in the HCP. The HCP states that 100% diversity occurs with a buffer of 100 feet, but in fact, when all data are used, aquatic invertebrate diversity is still increasing at a buffer of 197 feet. Using our calculations, then, a restricted harvest band of 30 feet would provide 78.5% of full effectiveness and a restricted harvest band of 10 feet would provide 67.9% effectiveness.

Fish Rearing Facilities and Stream Enhancement Projects

NAOCE-6

If habitat had been conserved, fish rearing facilities would not be needed. They represent a failure, not a mitigation. In our opinions, the aquatic organic matter-invertebrate food web is not being adequately considered, protected, or restored in this HCP, and so there is little reason to assume that fish rearing will augment present populations. Therefore to allow an Incidental Take Permit to cover the unintentional trapping, capture or take of listed fish species in the course of collecting unlisted species (HCP, Vol. I, p. 14) makes little sense. Protect the habitat and food web and there will be fish. To paraphrase Dr. James Karr, to put fish in a degraded habitat and expect them to thrive makes as much sense as placing kittens in the middle of an eight-lane freeway and expect them to have a long, happy life.

The high number of bank stabilization and instream channel projects is further evidence of already heavily impacted stream channels. Both the need for such projects and the projects themselves represent disturbance. In-channel projects intended to improve fish habitat can cause declines in other

biota such as foothill yellow-legged frogs (Fuller and Lind 1991). Such projects should be avoided by prevention of the problem initially. They should not be seen as acceptable mitigation as they are in this HCP. Where considered necessary because of past disturbance, they should be evaluated in total as another possible cumulative impact, and all members of the aquatic community should be considered. The sheer number of projects planned as part of the HCP, 50 /year (HCP, Vol. I, p.14), and past projects [979 stream enhancement projects since 1987(Vol. I, p. 24 and Vol. 5, Map 19)] suggest significant instream disturbance. No evaluation of effectiveness or impact of these projects is apparently being done. "To date surveys of fish utilization of instream structures have been done sporadically or not at all" (Vol. IV, Part D, Sec 1, p. 18). And it seems there is no consideration of the impact these projects may have on other species. This example illustrates one of the many problems of considering "management indicator species" rather than whole communities when devising management schemes.

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If "access improvement" projects involve the removal of natural, historical fish barriers (and we cannot tell whether they do or not, but know that this activity has been promoted by the California Fish and Game in the past) then they also will result in significant disturbance and likely change in invertebrate assemblages possibly even leading to the elimination of species that have evolved without fish predators in their habitats.

Springs

Springs are not considered aquatic resources in the HCP and are being used as watering areas for cattle (Vol IV, Part D, Table 2). In fact, extensive, detailed research on springs has proven them to be areas of rare and often endemic species. (Erman and Erman 1990, Erman 1998). Throughout the western U. S., cattle grazing is a major problem in the degradation of spring habitats. This example is yet another illustration of the pervasive problem in the HCP and EIS/EIR of considering a few species rather than whole communities.

NADCE-7

Monitoring

For monitoring to have meaning, appropriate reference streams must be selected. These are the experimental controls against which all the activities occurring on PALCO lands must be measured. For purposes of this HCP three reference streams in Redwood State Park (Cow Creek, Squaw Creek, and Canoe Creek) have been selected to represent "pristine" and "undisturbed" conditions (Vol. II, Part F, p. 7). We have recently visited one of these streams, Cow Creek. It could not be described as either pristine or undisturbed. We found man-made log check dams in the stream bottom, nylon mesh cloth anchoring the sides of the stream, log deflectors cabled together, redwoods cut and removed from the channel, fairly heavy sediment in some places, and an

NADCE-8

open canopy along the stream at perhaps a half mile back from the road. In short, the stream, though in moderately good condition, shows significant past disturbance and manipulation. The implications of selecting already disturbed streams as references is that conditions measured against them will appear better (less disturbed) than they really are.

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Furthermore, Cow Creek is a low gradient stream with gentle slopes on both sides. It appears from maps that this condition is also true for Squaw and Canoe Creeks. We note also that the three reference streams are in the same watershed. We suspect these streams may not be representative of many of the streams on PALCO land. Are there perhaps better reference streams in the Headwaters Forest than in the State Park?

Aquatic Macroinvertebrates

NADCE-9

We have commented extensively to the State in the past, during the California Department of Forestry Pilot Monitoring Study, concerning its aquatic invertebrate monitoring program and some of the problems in the assumptions the State is making. In our own studies on logging impacts on streams we found that some small-sized species of Ephemeroptera (species of Baetis), Plecoptera (species of Nemouridae), and Trichoptera(a species of Neothremma) became extremely abundant following logging and the impacts of increased light and sediment in streams (Erman, et al. 1977, Erman and Mahoney 1983, Wiggins and Erman 1987). Therefore, the continued use of an Ephemeroptera, Plecoptera, Trichoptera (EPT) to Chironomidae ratio, and the assumption made in this HCP that a fairly even distribution among all four groups reflects a good biotic condition, is incorrect (HCP, Vol. II, Sec. F, p. 3). It may reflect a highly disturbed condition. It is essential to know what "groups" are in those gross taxonomic units. The EPT index is not a measure of richness as stated on p. 2 (HCP, Vol. II, Sec. F).

These are not small points: these measures will be used to determine the condition of the aquatic biotic communities on PALCO lands. It is essential that the appropriate scale of taxonomic work be completed and that appropriate indices be used.

We are not comfortable with the 300 count method of sampling invertebrates (HCP, Vol. II, Sec. H, p. 11). We think that because of the species/area curve relationship, depauperate samples of fewer than 300 individuals from a disturbed site may appear to be as diverse as sites with far higher numbers of organisms. This phenomenon could occur because in a depauperate site all individuals collected would be identified, whereas in a site of far greater abundance and potential greater diversity, a smaller fraction of the sample is identified. We have yet to see a convincing test of this issue.

The Hilsenhoff index (HCP, Vol. II, Sec. H, p. 11) requires knowledge of species and their pollution tolerance and has not been determined for California species. In most parts of California we do not have good knowledge of aquatic invertebrate species let alone their pollution tolerances. Further, there is no work described in this HCP that would permit the identification of species because adult forms, upon which most species identification is based, are not being collected.

NADCE-9 CON.

The Simpson index is improperly described here. In conventional use, a higher Simpson index (D) would mean lower diversity, not higher, and it is therefore usually expressed as 1–D or 1/D, so that a higher number does mean higher diversity (see for example, Erman et al. 1977, Magurran 1988). But in the description given in the HCP it is not clear that the author is describing this conventional usage (HCP, Vol. II, Sec. F, p. 3 and Sec. H, p. 11), and it appears that use of the index may be backwards.

No list of References is given for HCP, Vol. II, Sec. F although citations are made in the text. One source, Usinger 1956 is out of date and obsolete as a taxonomic reference for California aquatic insects and should not be used (Erman and Nagano 1992, Erman 1996). Because it is cited here, it makes us wonder if it is being used by those doing the invertebrate work for PALCO. And if so, it casts doubt on all the invertebrate work.

Trend monitoring may be yet another source of error in the monitoring plan presented in the HCP. The current condition of streams is poor in many places. Monitoring trends may show no improvement or some improvement but in either case, it may not indicate significant or meaningful improvement or that streams are in good condition. These streams have a long way to go toward restoration to good conditions. The following statement occurs in the HCP: "If conditions are stable, or improve, then current practices are not resulting in changes in stream conditions that will increase any negative impact to aquatic resources over time." (Vol. IV, Part D, p 110). PALCO will consider its operations successful if "conditions are stable." And yet the HCP has provided ample evidence that the current conditions are not good.

NADCE-10

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Table 1. Degreee of functionality (% of full function) under existing forest practice rules and proposed options by PALCO and NMFS for three components of riparian condition.[1]

Stream Class	Surface Sediment	LWD	Canopy	Multiplicative[2] Model	Additive[3] Model
Existing Forest Practice Rules					
Class I	28.6	34.8	68.7	**6.8**	**44.0**
Class II	23.7	23.1	57.1	**3.1**	**34.6**
PALCO Approach					
Class I	86.7	79.8	93.6	**64.8**	**86.7**
Class II	79.2	44.1	72.9	**25.5**	**65.4**
NMFS Approach (Maximum option)					
Class I	100	87.4	98.3	**85.9**	**95.2**
Class II	100	85.6	92.5	**79.2**	**92.7**

[1] From Volume IV, Part D, Sec. 5, Table "Summary of Results for ... Incremental Benefit Analysis"
[2] Final value is the product of three components
[3] Final value is average of the three values

Erman Erman

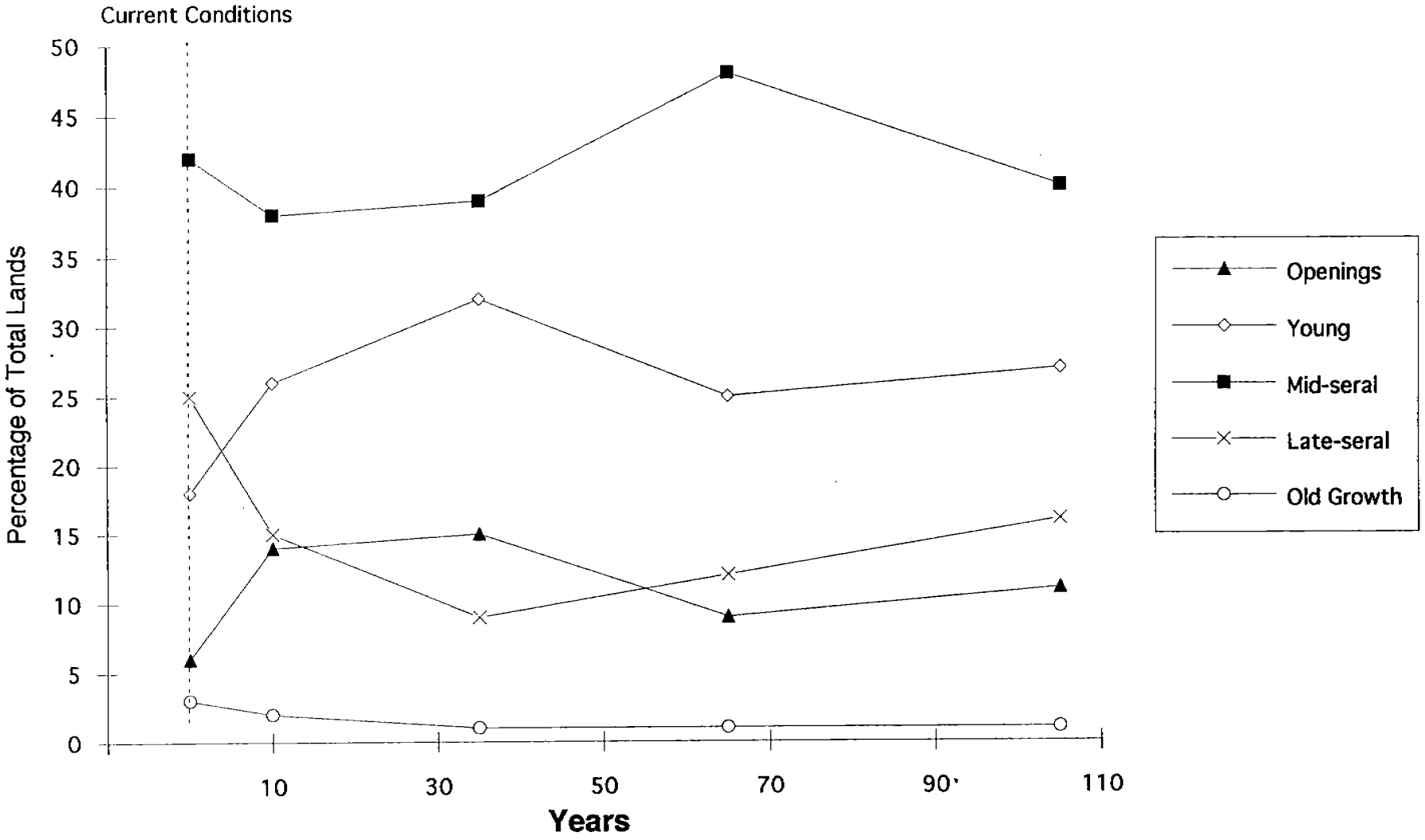

Figure 1 Summary of forest type trends presented in the HCP.

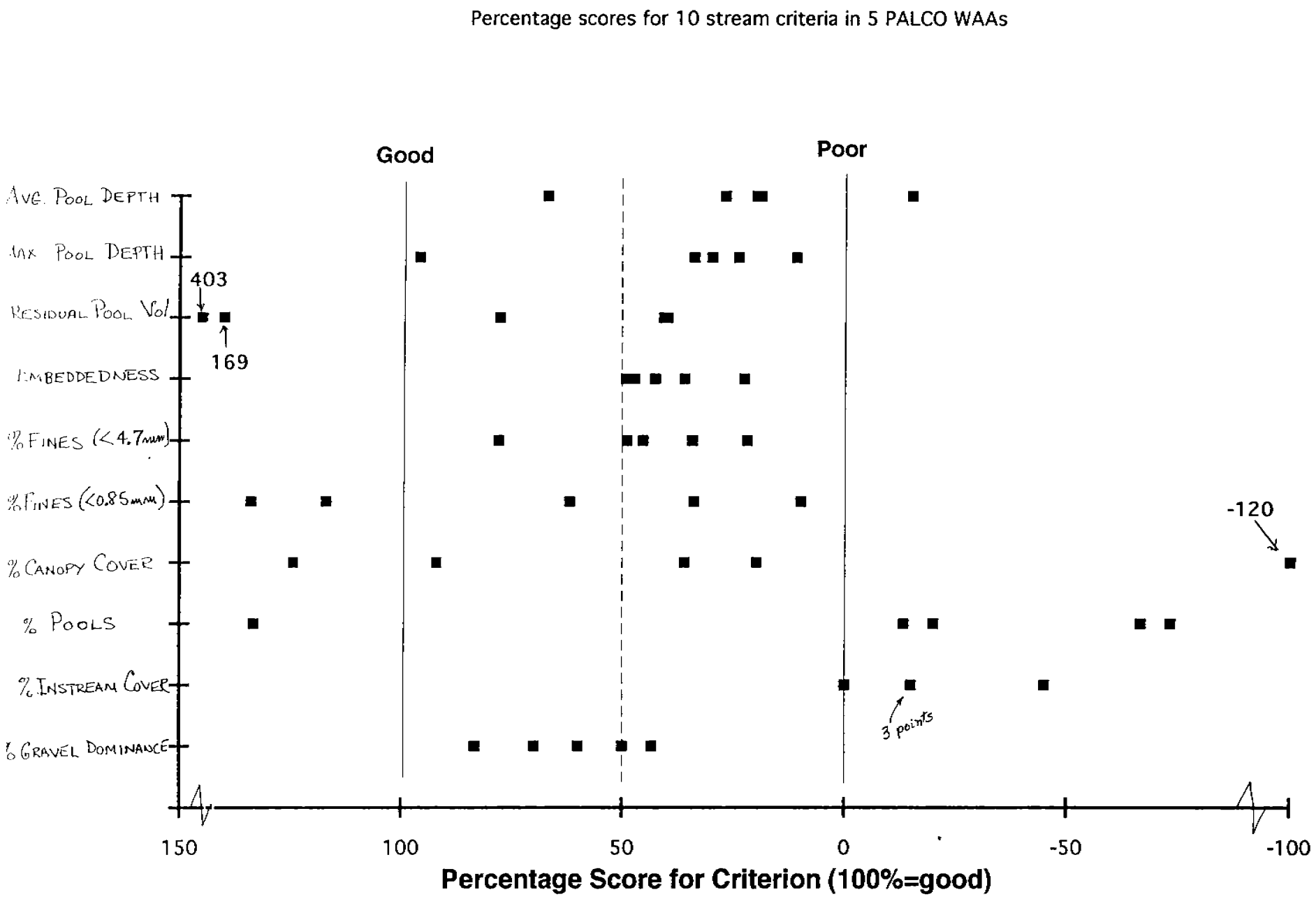

Figure 2 Present condition in PALCO watersheds based on ten criteria.

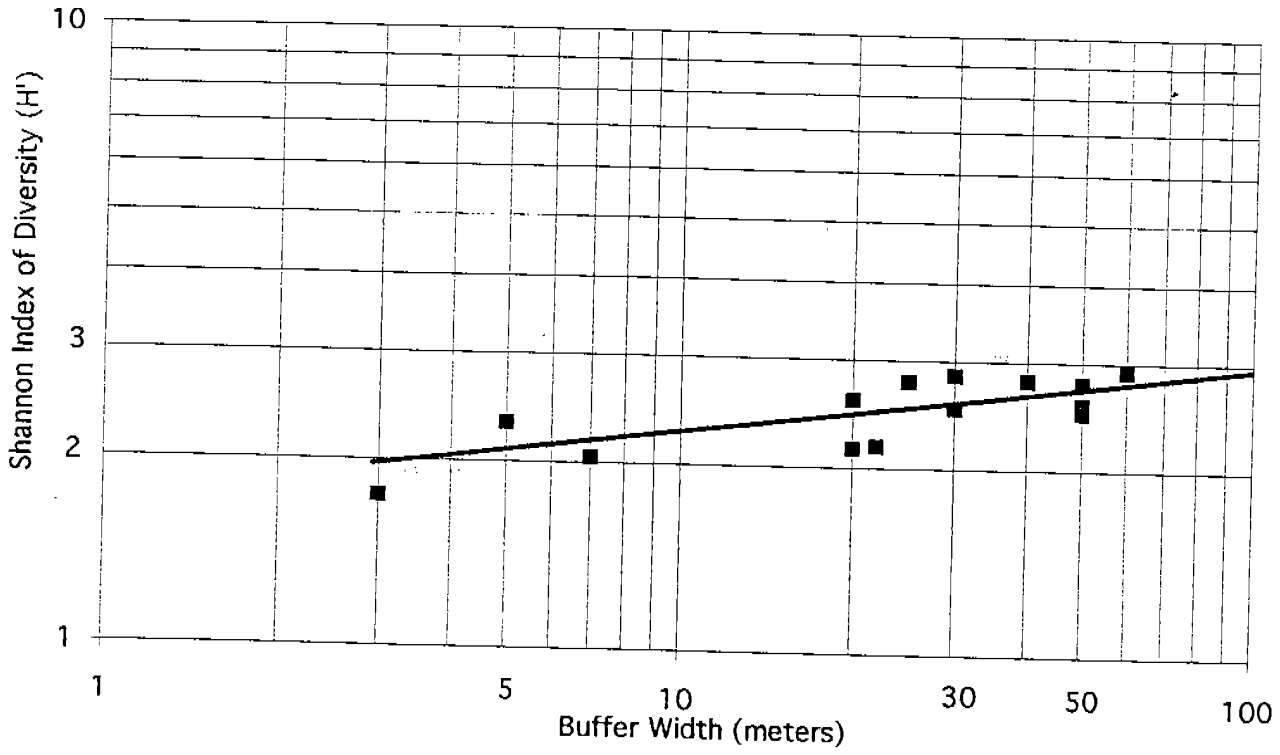

Figure 3

The relationship between buffer width and stream macroinvertebrate diversity for 14 buffered streams studied by Erman et al. (1977).

Erman y Erman